HIGHFLIGHT

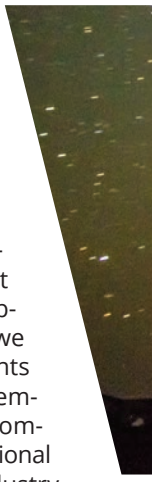
WILLIAM E. BOEING

DEPARTMENT OF AERONAUTICS & ASTRONAUTICS | **SPRING 2017**

IN THIS ISSUE

>>*aa.washington.edu*

MESSAGE FROM THE CHAIR



The following pages show that this has been an exciting and successful year for the A&A department. The achievements of our faculty, students and alumni continue to make us proud, and are propelling us toward our goal of becoming one of the top ten programs in the nation.

We have seen remarkable growth in enrollment over the last year, and now have 461 students in our department. The students in our bachelor's, master's, and doctoral programs are learning not only engineering fundamentals, they are also learning to become leaders and entrepreneurs through hands-on projects and cutting-edge research collaborations. The faculty in our department are actively engaged with prominent aerospace companies and research laboratories world-wide. With the rapidly changing technology in our industry, we will continue to improve and expand our curriculum to ensure that our students have up-to-date knowledge, relevant experience, and modern tools as they embark on their careers. One example of this philosophy is the adoption of "computational thinking." By providing students access to cutting-edge computational tools, we expose them to the foundational software that drives our industry while aligning this experience with critcal fundamentals in rigorous coursework.

We have also undertaken new challenges and initiatives, including a focus on space engineering, low speed aerodynamics, and aerospace manufacturing and materials. This effort is leading to the development of three new research centers: (1) space policy and engineering, encompassing autonomy in space systems; (2) a center of excellence in low speed aerodynamics; and (3) an automated fiber placement and additive manufacturing center. The research carried out in these centers will necessarily be collaborative and multi-disciplinary with a diverse faculty base from the College of Engineering as well as participation from across the broader university. Years of active collaboration with Boeing have resulted in the creation of a new "Lines, Loads and Laws" program, a truly integrated approach to the design and analysis of airplanes. By working together we are progressing toward our goal of reducing cost in flight testing.

In recent months, we have added some outstanding new faculty and staff members and said goodbye to others who have retired. We have had losses as well. Joe Sutter (BS 43), the father of the 747, passed away last year. Joe was not only a giant in the field of aeronautics, he was a steadfast friend and supporter of A&A. Professor Kuen Lin, who had been with our department for 33 years and taught thousands of students including many Boeing engineers, passed away unexpectedly. We also lost a young alumna, Anita Abrego, who made an outstanding impact in her life. We mourn their passing.

Our students, faculty and alumni have also had some remarkable successes this past year. From prestigious research publications to unprecedented rocket launches, we are proud of all that they achieve. We are also very grateful for what our alumni give back to the department — as donors, mentors, project sponsors, and guest speakers, our alumni are reaching out to provide opportunities to future generations of engineers. We hope you enjoy reading about them in this issue, and we encourage you to stay involved and stay in touch with the A&A department.

BOEING-EGTVEDT CHAIR
ANTHONY M. WAAS

HIGHFLIGHT 2017

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HAVE NEWS?

We like hearing from you.
Email us at: highflight@aa.washington.edu

CHAIR'S DISTINGUISHED SEMINAR SERIES

This year, we welcomed 21 distinguished speakers from their resepctive fields, including featured presentations from research leaders at SpaceX and Amazon Prime Air.

The Chair's Distinguished Seminar Series brings scholars of national and international reputation who have made an impact in the field of aerospace engineering and beyond. This seminar series covers a diversity of topics of current interest to those in academia, industry and the general public. It is our hope that these monthly seminars will encourage an exchange of ideas and bring aerospace engineering and science to the forefront.

>> Entire series posted at: *aa.washington.edu/ChairSeminar*

STAFF NEWS

RETIREMENTS: **Brian Leverson**, the department's IT architect, has retired after 28 years. Brian implemented many computing advancements and was a pioneer in adopting new technologies and IT improvements, including Web conversions, creating student computing labs, and providing high powered computing to students.

PROMOTIONS: Congratulations to **Gaia Borgias Brown,** who has been promoted to the position of Associate Director, External and Industry Relations.

NEW HIRES: We are pleased to welcome **Eliot George**, Research Scientist Engineer, focused on engineering support for research and academics, **Pamela McGrath**, department administrator, who comes to us from the UW Bothell School of Business, and **Steve Scheier**, senior computer specialist, who is responsible for managing our department's computing capabilities.

We are happy to have such an outstanding group of new staff members.

Eliot George
Research Scientist Engineer

Pamela McGrath
Administrator

Steve Scheier
Senior Computer Specialist

DIRECT TO COLLEGE ADMISSION BEGINS 2018

The College of Engineering is taking a significant step to improve undergraduate engineering students' educational experiences by offering Direct to College admission beginning with the entering freshman class of 2018.

This change will assure incoming freshman students who are admitted into the college and their families that they will be able to pursue an engineering degree at the UW. It will also allow the college to more fully engage these students in an immersive engineering experience from their first day on campus, while still maintaining opportunities for transfer and other UW students to pursue engineering degrees. Approximately 800 undergraduate students receive engineering degrees from the UW each year.

Following tri-campus review, the new admission pathway was approved March 31, 2017 by the UW Faculty Council on Academic Standards, which oversees changes to UW academic and admissions policies.

Starting with next fall's applicants for the 2018 freshman class, the new process will ensure that roughly half of the students who receive undergraduate engineering degrees from the UW will have been admitted directly to the college as freshmen. The remaining engineering degrees will be awarded to students who transferred to the UW, primarily from Washington community colleges, or to students who were not admitted directly to the college but applied later as UW freshmen and sophomores.

Currently, most aspiring engineers at the UW are not accepted into engineering majors until they complete a competitive process at the end of their sophomore years. This creates uncertainty among students about whether they will be able to pursue their intended degree and career path. The Direct to College admission policy guarantees that admitted freshmen who continue to meet course requirements will find an academic home in one of the university's ten engineering departments.

"Student demand for engineering education is soaring, but with current resources, we can admit fewer than half of the well-qualified students who come to UW to pursue an engineering major," said Michael Bragg, the Frank & Julie Jungers Dean of Engineering at the UW, "This new admission policy won't solve our capacity problem — that will require additional state investment to grow our programs. But we will be able to offer more transparency and certainty to incoming UW freshmen about whether this is a place where they can pursue their passion for engineering."

>> Direct to College FAQs:

engr.washington.edu/admission/directtocollege/faq

2017 CAPSTONE PROGRAM

>> View Projects

aa.washington.edu/students/academics/capstone/2017

The BSAAE includes an intensive senior capstone project providing students with focused industry mentoring, interdisciplinary teamwork, written and oral communication skills, engagement with regulatory requirements, fiscal and procurement management, social and ethical considerations, and market awareness. The 2016-2017 Senior Capstone projects include the following options:

Space Systems Design

(Advisers: Knowlen, Vaughan)

Large team effort focusing on design and construction of a cubesat rocket payload. This team collaborates closely with the extracurricular student organization "SARP," which includes freshmen through junior undergraduates.

Aircraft Design

(Advisers: Livne, Nelson)

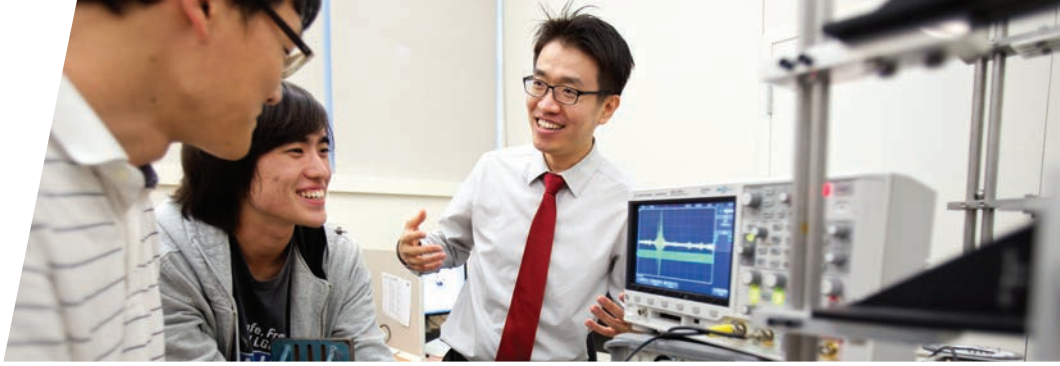
Large team effort focusing on design, construction and flight of a scaled fixed-wing aircraft from first principles.

Industry Sponsored Projects

(Faculty lead: Morgansen)

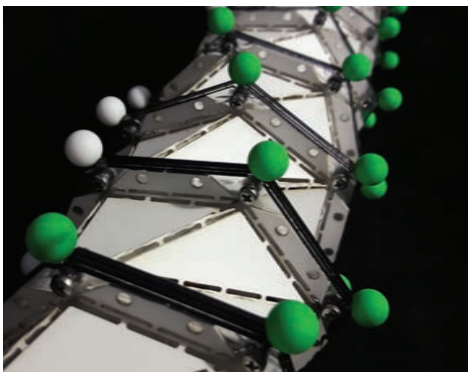
- **BOEING** | Airplane Design & Modification for Short-Range 5-Passenger Electric Commuter Aircraft
- **DAHER AEROSPACE** | Process Validation and Characterization of a 'Vacuum Bag Only' (VBO) Composites Material - Tests and Digital Model Comparison
- **MICASENSE** | Aerial Pointing and Stabilization System for Advanced Sensors and Testing with Unmanned Aircraft Systems (MAPPS)
- **MSNW** | Modular Electric Propulsion Diagnostic Instrumentation Cluster (MEDIC Cubesat)
- **STELIA AEROSPACE** | Robotic Solution for Aerostructure Bracket Positioning (ROCKETIN)
- **STUDENT FUNDED** | Integration of Firefighting Devices with UAV Deployment (SwarmFX)

Laboratory for Engineered Materials & Structures (LEMS)



Impact mitigation and vibration filtering have been a longstanding subject of research in the field of aerospace and mechanical engineering, but challenges remain in developing highly efficient structures. For example, a significant portion of shock absorbing structures relies on crushable metal, which often suffers from the lack of energy absorption performance and also prevents it from being used more than one time. **Professor Jinkyu Yang's** research has been motivated by a fundamental question: Can we design novel engineered structures that can absorb impact in a more efficient and controllable manner? Can we also integrate unique features, such as deployability, tunability, and resuability, into these structures?

To tackle these challenges, Professor Yang has leveraged a recent advancement of new material systems called mechanical metamaterials. Mechanical metamaterials are an engineered material system that exhibits novel mechanical properties unprecedented in nature, such as negative mass and stiffness. These unique capabilities are obtained not from their chemical compositions, but from their sophisticated engineering architectures. Professor Yang's team has been recognized as one of the leading groups in the design, fabrication, and testing of such novel mechanical metamaterial systems. The team's unique expertise lies in manipulating dynamic responses (e.g., stress wave propagation) of solids/structures in the settings of novel mechanical platforms (e.g., woodpile- and origami-based mechanical metamaterials).



Notable accomplishments of Professor Yang's team in the field of mechanical metamaterials and others include:

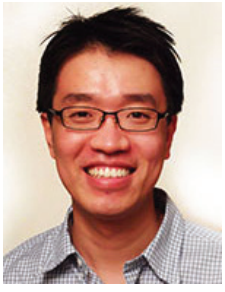
- *Discovery and verification of turbulence-like energy cascades in solids for efficient attenuation of impact.*
- *Formation of rarefaction waves in solids to convert high-amplitude compressive waves to low-amplitude tensile waves for impact mitigation.*
- *Design of mechanical diodes and switches which enable controlling the flow of mechanical energy, similar to the operations of electronic devices.*
- *Band-gap engineering in mechanical systems for filtering a selected range of frequency components of vibrations, analogous to the working principle of photonic crystals.*
- *Design of non-conventional fiber-reinforced composites for achieving superior mechanical properties and structural health monitoring capabilities.*

These findings have been featured in high-impact journals, such as *Nature Communications*, *Nature Scientific Reports*, and *Physical Review Letters* (a list of publications can be found on Professor Yang's website). Professor Yang is the recipient of several prestigious awards, including the National Science Foundation (NSF) Faculty CAREER Award, and the Samsung Think Tank Award.

Since 2013, Professor Yang has served as the director of the Laboratory for Engineered Materials and Structures (LEMS) in the A&A department. He supervises a group of graduate students, undergraduate interns, and postdoctoral and visiting scholars in LEMS under the sponsorship of the US Air Force Office of Scientific Research, the US Office of Naval Research, and the NSF among others. Members of LEMS work closely with distinguished scholars from all over the world, including Oxford University in the UK, CNRS in France, California Institute of Technology and Harvard University in the US, University of Tokyo in Japan, and Seoul National University in Korea. In recent years, LEMS has produced a talented pool of undergraduate students, who have been awarded NSF Fellowships, NASA-Space Grant Scholarships, Mary-Gates Scholarships, and AIAA Undergraduate Research Competition Awards.

What is the ultimate vision of LEMS? Professor Yang says, "Energy flow control devices in electrical engineering (e.g., diodes and transistors) have revolutionized modern industry. Their mechanical counterparts are still elusive. However, the advancement of novel material technologies, represented by acoustic/mechanical metamaterials, will enable the control of mechanical energy flow in structures. This will, in turn, lead to the development of next-generation aerospace, military, and commercial structures with advanced impact mitigation, noise filtering, and energy harvesting capabilities."

JINKYU YANG



Assistant Professor
aa.washington.edu/people/faculty/yang

FACULTY RETIREMENT
KEITH HOLSAPPLE

Emeritus Professor
https://www.aa.washington.edu/people/faculty/holsapple

Professor Keith Holsapple retired in June 2016, after serving the department for more than 50 years. Professor Holsapple is also an alumnus of A&A, having received his bachelor's, master's and doctoral degrees here, and joining the faculty soon thereafter. He also served as associate dean of the College of Engineering from 1988 – 1997.

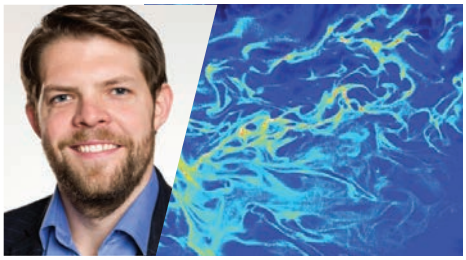
With a background in structures, engineering mechanics and numerical methods, his current research interests are focused on hypervelocity impacts and material and numerical modeling, work he continues now.

These studies primariy apply to applications in the planetary sciences of small bodies of the solar system. His recent studies include the definition of the material behavior of those bodies, and models to describe those in computer studies. He has formulated and solved the problem of the equilibrium shapes, spins and tidal disruptions of solid asteroid bodies using the models of soil and rock mechanics, generalizing the well-known and classical fluid models of Maclaurin, Jacobi, Roche and others. He has been active in the studies of mitigation methods for Earth-threatening asteroids, has presented talks at various AIAA and NASA sponsored meetings and has performed code calculations of the mitigation of threatening asteroids and comets by impacts and by nuclear weapons.

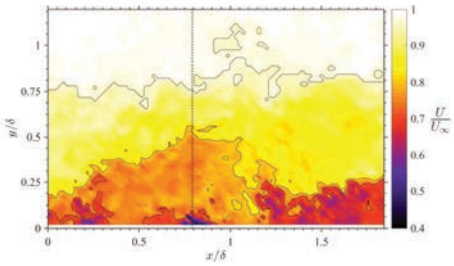
Professor Holsapple also has the distinction of having an asteroid named after him: Asteroid Holsapple (Asteroid 20360)!

Image credit: NASA/JPL-Caltech

NEW FACULTY
OWEN WILLIAMS



Research Assistant Professor
https://www.aa.washington.edu/people/faculty/williams



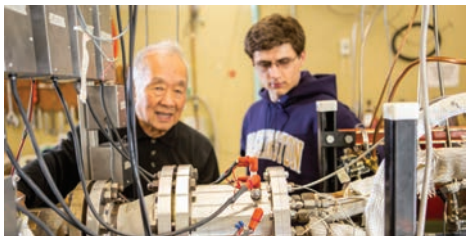
Owen Williams joined our department in 2016 as a research assistant professor. Professor Williams studies the effects of non-uniform fluid properties (such as density or viscosity) on turbulence and the resulting impact on real world vehicles and devices. These non-uniformities can be due to heat-transfer, compressibility or additives, with applications to the development of high-speed vehicles, environmental or biomedical flows. Previous work has primarily focused on the examination of high-speed/hypersonic turbulent flows and the stratified atmosphere.

Professor Williams was born and educated in Toronto, Canada before moving to England to complete his Master's in Engineering from Imperial College, London. He obtained his PhD in Mechanical and Aerospace Engineering from Princeton University, experimentally examining the effects of compressibility and stratification on wall-bounded turbulence. Before joining the University of Washington, he was a research associate at the University of Maryland, computationally examining turbulent scaling theories for hypersonic turbulent flows as well as shock boundary layer interactions.

UNIVERSITY of WASHINGTON
TOHOKU UNIVERSITY

The UW and Tohoku University in Japan have established an Academic Open Space partnership for innovations in aerospace, clean energy and disaster preparedness. Several A&A faculty members spoke at the joint symposium on April 13, 2017, including **Dean Michael Bragg**, **A&A Chair Anthony Waas**, and **Associate Chair for Academics, Kristi Morgansen.**

Professor Uri Shumlak's ZaP Laboratory was visited by Washington State Senate staff on Aug. 26, 2016. Rachel Peterson from Senator Patty Murray's office visited campus to tour the UW A&A labs and receive an update on current research relevant to the US Senate Appropriations Subcommittee on Energy and Water.



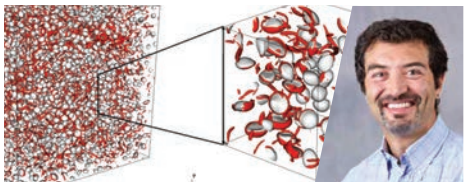
Highlighted in the December 2016 issue of the *AIAA Aerospace America 2016 Year in Review* was work being done on the Rotating Detonation Engine (RDE) or Pressure Gain Combustor (PGC) by **Professors Mitsuru Kurosaka** and **Carl Knowlen** and their students. Also contributing to the project were **Professors Mattick, Breidenthal** and **Bruckner.**

Professor Kristi Morgansen *(pictured above, lower left)* presented a talk on Sensing and Actuation in Biological and Engineered Systems at the UW Computer Science & Engineering Frontiers of Science and Engineering in conjunction with the UW chapters of ACM-W and the Society of Women Engineers. This January 2017 event recognized the accomplishments of some of the University of Washington's outstanding women scientists and engineers.

Assistant Professor Marco Salviato has been named the recipient of the American Society of Mechanical Engineering (ASME) Haythornthwaite Young Investigator Award. The prestigious award, based on selection by the ASME Applied Mechanics Division, recognizes excellence in theoretical and applied mechanics research for early career faculty and provides a grant to support the acquisition of key research equipment. The award will support Prof. Salviato's research on the development of bio-inspired materials and graphene nanocomposites.

>> UW A&A News:
aa.washington.edu/news

Professor Dana Dabiri and **Affiliate Professor Robert Yancey** were both distinguished by their notable contributions to the aerospace community and honored with the title of AIAA Associate Technical Fellow. This is a distinction that only one out of 150 voting members earns through peer nomination and a rigorous selection and approval process each year.



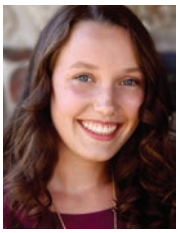
The latest two papers published by **Professor Antonino Ferrante** (principal investigator of the Computational Fluid Mechanics group) were selected by the *Journal of Fluid Mechanics* to receive special recognition. The 2017 paper by **Michael Dodd** and Ferrante *(JFM 2016)* is titled, "On the interaction of Taylor length scale size droplets and isotropic turbulence."

Professor and Chair Anthony Waas received the 2017 American Institute of Aeronautics and Astronautics (AIAA) and the American Society for Composites (ASC), James H. Starnes, Jr. Award. This award recognizes his impactful contributions to experimental, analytical and computational aspects of composite structural mechanics, his commitment to mentoring the next generation, and his service to the field. Professor Waas also moderated a panel discussion on Additive Manufacturing at the Washington Aerospace Futures Alliance 11th Annual Governor's Aerospace Summit and spoke at the AIAA Spring Technical Dinner discussing his work with multi-scale modeling of the deformation response of composite structures.

In 2016, **Prof. James C. Hermanson** was awarded a prestigious Fulbright Fellowship to collaborate with the Center of Applied Space Technology and Microgravity at the University of Bremen in Germany (ZARM). Each summer, Hermanson travels to Germany to work in concert with the Combustion Technology group headed by Christian Eigenbrod on a new DLR-funded project to study the combustion of single oxygen droplets in a hydrogen environment.

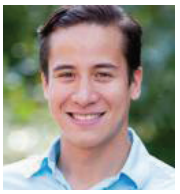
The National Geographic TV special "Mars" shows an advanced version of a WAVAR machine to extract humidity from the air on the planet. The WAVAR, which stood for Water Vapor Adsorption Reactor, was developed by **Professor Adam Bruckner** and his students in the late 90's. Today, Prof. Bruckner and his graduate student, **Osa Igbinosun**, are working on developing a natural WAVAR system that would work by extracting water vapor from the Martian soil and heating the soil itself with microwaves.

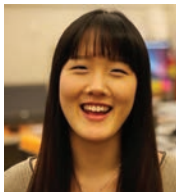
Research Professor Christopher Lum participated in a panel with Dr. Lav R. Khot from Washington State University at the 2016 Unmanned Aerial Systems (UAS) Agricultural and Academic Conference to discuss the latest UAS trends in agriculture. The panel explored current UAS technology and future opportunities for technology adoption and employment in the agriculture industry.



DEAN'S MEDALIST | **ALEXIS HARROUN**

Senior **Alexis Harroun** was selected as the 2017 College of Engineering Dean's Medalist. Alexis, who is the propulsion technical lead for the Society for Advanced Rocket Propulsion and senior class president for the UW AIAA student chapter, is the first student from A&A to receive this honor.

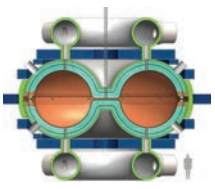




NOTABLE ACHIEVEMENTS

Sierra Adibi, (Adviser, Prof. Kristi Morgansen), received a National Defense Science and Engineering Graduate Fellowship. **Dillon Foight,** (Adviser, Prof. Anshu Narang-Siddarth), received a National Science Foundation Fellowship. **Gustavo Eidji Camarinha Fujiwara,** (Adviser, Prof. Michael Bragg), has been awarded a UW Graduate School Latino/a Scholars Graduate School Fellowship. **Helen Kim,** (Adviser, Prof. Jinkyu Yang), received the Zonta International Amelia Earhart Fellowship.

A&A graduate student **Daniel Crews**' team, Explorer, won first prize at the 2017 Caltech Space Challenge held March 26 – 31, 2017. Daniel was selected from an applicant pool of more than 800 students from universities world-wide to be one of 32 participants in the challenge. Students were brought together into two teams and given a mission problem to be solved in five days. This year's mission was to design a plan for "Lunarport," a launch and supply station for deep space missions. Team Explorer was selected as the winner of the challenge.



STUDENT STARTUP

Derek Sutherland, PhD candidate, who works with Professor Thomas Jarboe in the Steady Inductive Helicity Injected Torus (HIT-SI) research group, is the CEO of a new start-up company called CTFusion. The company, which is a spin-off from the work done by the HIT-SI Research Group, seeks to develop a novel approach to spheromak fusion reactors. Alumnus **Aaron Hossack (PhD 15),** a post-doctoral research associate in A&A, is the company's chief technology officer.

STUDENT SERVICE

Our students are heroes! In December, an A&A professor had a cardiac arrest. Students and others acted quickly by beginning CPR, calling 911, and importantly, applying an automated external defibrillator from one of the labs. These efforts saved the professor's life--he has made a full recovery and we are all grateful to students **Maggie Banks, Elliot Claveau, Eleanor Forbes, Osa Igbinosun, Kyle Shipley,** and to **Profs. Golingo** and **Hermanson, Dr. Giovanni Nino,** and **Victor Aque,** all of whom did everything right during this emergency.

A&A students served as Earth Science Fair mentors at Bryant Elementary School. The mentors created a scientific investigation and worked with a small group of 5th graders to formulate a hypothesis, develop appropriate experiments, analyze results, and draw/communicate conclusions. Bryant 5th grade students greatly benefited from exposure to adult mentors who are pursuing a career in the sciences. Thanks to A&A undergraduate **Hunter Mellema**, and graduate students **Sierra Adibi** and **Stephanie Camello** for providing inspired leadership, enthusiasm and expertise to these students.

Students in the **Autonomous Flight Systems Laboratory** built a mobile flight operations center to conduct field experiments related to unmanned aerial systems (UAS). The mobile flight operations center is a large, enclosed trailer that supports a range of flight test applications including aerial mapping, crop inspection, multi-spectral imagery, visual flight navigation and wildlife preservation.

STUDENT CLUBS

SARP

The Society for Advanced Rocket Propulsion's (SARP) 70 member student team will be competing in this summer's Spaceport America Cup, the world's largest international intercollegiate rocket engineering competition. The team is divided into four groups: Structures, Avionics, Recovery, & Propulsion. The UW SARP team plans to design, build, and launch their rocket, Big Dawg, to 30,000 ft.

>> UW SARP
www.facebook.com/uwsarp

DBF

Photo credit: Lexi Ott

Traveling to the middle of the Sonoran Desert in Tucson, Arizona, four members of **Design Build Fly (DBF)** competed in the AIAA's international DBF fly-off representing the University of Washington with their remote-controlled aircraft. The missions and design constraints for the competition change annually. This year, the team was tasked with designing, constructing, and operating a tube-launched UAV with the ability to carry a payload of at least three hockey pucks. This was the 10th year that UW has been represented in this competition. From April 20th through 23rd, the team worked to successfully fly three different missions and placed highly against 95 competing teams from universities around the world.

>> UW DBF
www.facebook.com/uwdbf

HUSKY ROBOTICS | *Story Credit: Ben Estroff*

UW A&A students on the **Husky Robotics Team** are competing in the University Rover Challenge (URC) for their fifth year. This club provides opportunities for students to learn leadership skills, gain hands-on experience in project management, and design integrated hardware, software and program planning solutions while carrying out simulated space exploration missions. The competition is hosted by The Mars Society, which has selected Husky Robotics as one of 36 international teams to participate this year.

THE CHALLENGE: *Design and build Mars rovers that will one day work alongside human explorers in the field.*

Previous competitions only required remote control rovers, but this year includes an autonomous navigation challenge. Team captain **Thomas Pryor** and software lead **Trevor Hedges**, both juniors in the A&A department, have led the team's development of the autonomous control and navigation code, alongside systems lead Brian Lunder (CSE) and electronics lead Justin Almaras (EE). To speed development, the team 3D printed miniature versions of the rover, to give the software team testbeds and drivable prototypes to work on well before the rover was ready to drive. These minirovers were funded in part by the A&A department, and have been an invaluable asset to building the software team's expertise in autonomous controls and navigation.

Autonomous navigation is just one of four challenges of the competition. The rover also has to be able to perform the following tasks:

EXTREME RETRIEVAL AND DELIVERY: *The rover operators are supporting operations on the Martian surface, and must pick up, carry, and deliver objects to given points by navigating hazards such as steep sandy slopes, sharp rock beds, sudden crevasses, and signal-blocking outcroppings. This tests the team's navigation skills, and the rover's durability and reliability.*

EQUIPMENT SERVICING: *The rover is required to attach a wagon to itself, towing a fuel canister to a generator and refueling it. This tests the precision and strength of the arm, and the team's ability to do fine control and manipulation.*

SCIENCE CACHE: *The rover is fitted with a science station designed by the team, and sets out into the field to take soil samples for onboard analysis and delivery to the science team, who then use the results to create a presentation about the habitability of Mars.*

The diversity of the tasks means that working with students from other departments and backgrounds is vital to the success of Husky Robotics. Over the past five years, the UW Husky Robotics team has grown from 8 to 76 student members and attracted students from many backgrounds and majors, including engineering, music, accounting, and political science. With interest and membership in the team growing, mechanical systems lead **Tyler Mundt** and team captain Thomas Pryor championed substantial reforms to the team's constitution to handle decision-making, ensure timely part production, and provide better communications between the rover subsystem teams. Their combined

(Story continues on p.10)

efforts helped the team build this year's sleek new rover faster than in any previous year, with greater oversight to catch issues during design and production.

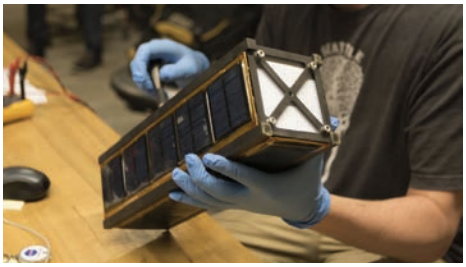
The design and planning phase lasts two quarters, with veterans doing general design work over the summer and finalizing designs as part of new member training in autumn. Fabrication starts in winter, leading to testing and debugging in the spring. The team is organized into subsystems (e.g. Arm, Chassis, Electronics, Software, and Science) with leads under an executive board providing experienced engineering and financial oversight. The business team handles fundraising and publicity, and a manufacturing lead ensures timely production of the rover. Founded under the Mechanical Engineering department, Husky Robotics makes extensive use of the ME machine shop to manufacture the chassis, arm, and science station.

The URC is an increasingly competitive event that requires talented, interdisciplinary teams to adapt, collaborate, and push the boundaries of what is possible.

You can follow their journey on Facebook.

>> UW Husky Robotics
www.facebook.com/uwrobots

UW CUBESAT TEAM



The UW CubeSat Team is creating the first student-built small satellite in Washington State. The UW team, along with a team from Washington State University, was selected by NASA to build the tiny 'CubeSats." The UW's Cubesat, nicknamed DubSat1, which measures 10 cm by 10 cm by 30 cm, is scheduled to launch into low-Earth orbit in 2018, and will send data and photos back to Earth for three to four months.

A&A Department students involved in the project include seniors **Hunter Mellema**, principal engineer and **Chayse Aubuchon**, propulsion team lead; graduate students **Bijan Barzgaran**, creating the simulations and computer models used to design and validate attitude control algorithms; **Mathias Hudoba de Badyn**, designing attitude control estimator and working to implement code on MSP432 microcontrollers; and **Taylor Reynolds**, designing BDOT controller and magnetorquer system for detumbling the satellite. Also assisting the students is postdoctoral fellow **Dr. Unsik Lee**, designing control algorithms for actuators and orbit propagator for estimating satellite position; and alumnus **Krish Kaycee (BS 12, MSAA 16)**, an aerospace engineer at Planetary Resources, who is mentoring the attitude determination and control team.

This team is part of the NASA Space Grant program, led by Prof. Robert Winglee in UW Earth & Space Sciences. The team has also received funding from JCATI in partnership with Eagle Harbor Technologies and Aerojet Rocketdyne.

>> UW CubeSat Team
www.facebook.com/uwcubesat

UW HYPERLOOP

In January 2017, SpaceX offered its Hyperloop transportation services to 27 teams from around the world in the first Hyperloop Pod Competition at the SpaceX track. The competition's goal is to accelerate the development of functional prototypes and encourage innovation by challenging teams to design and build the best high-speed pod. Teams put their pods through a litany of tests, made possible through the Hyperloop system. This competition was the first of its kind anywhere in the world. *(http://www.spacex.com/hyperloop)*

Recent A&A graduate **Aditi Bhide (MS 16)** was part of the UW team selected to compete in the SpaceX sponsored challenge to design and fabricate a Hyperloop pod. Last year, the UW team won the Safety Subsystem Technical Excellence Award. This year the competition went global. After a week in California, the UW Hyperloop team placed 6th overall in the world, and 4th in the US. This new transportation model could make the trip between Seattle and Portland take as little as 15 minutes.

>> UW Hyperloop
www.facebook.com/hyperloopuw

UW AIAA

The UW chapter of the AIAA provides leadership, mentorship and networking opportunities to UW students in Aeronautics & Astronautics. This past year's activities included a "Night With Industry" with corporate participation from B/E Aerospace, Blue Origin, Boeing, Greenpoint Technologies, and Systima Technologies. Representatives from these companies offered valuable advice about the engineering profession and suggested strategies for future employment.

In turn, the AIAA student chapter serves as an ambassador team, inspiring the next generation of engineers. This year they attended Highland Terrace Elementary School *Science Night* where they encouraged young enthusiasts to pursue future studies in the field of aerospace engineering.

Throughout the year, the UW AIAA further supports networking connections by coordinating industry tours for students throughout the department.

Congratulations to our student award winners at the 2017 AIAA Region VI Student Conference March 17 -19 in San Jose, California! As they did in 2016, this year's graduate students made a clean sweep in the Master's Research category:

1st Place – *Balakumaran Gopalarethinam (Prof. JK Yang, adviser; Hiromi Yasuda, mentor)*

2nd Place – *Eric Wheeler (Prof. Carl Knowlen, Prof. Mitsuru Kurosaka, advisers)*

3rd Place (tie) – *Trever Byrd (Prof. Carl Knowlen, adviser) and Wei-Siang Lay (Dr. Roger Raman, adviser)*

Our students also took the top two prizes in the Undergraduate Research category:

1st Place – *Greg Derk and Angela Kimber (Prof. Carl Knowlen, adviser)*

2nd Place - *Chayanat Wanitthananon (Prof. JK Yang, adviser; Seunghyun Ko, mentor)*

>> AIAA
www.pnwaiaa.org

JCATI AWARDS 2016

PI: Antonio Ferrante *"Direct Numerical Simulation of an Aft-Body Flow"*
Partner: The Boeing Company

PI: Carl Knowlen, CO-PI: Adam Bruckner *"A High Pressure Baffled-Tube Ram Accelerator"* **Partners:** HyperSciences, Inc., Systima Technologies, Inc.

PI: Kristi Morgansen *"Modeling and Control of a Shape Actuated Quadrotor"*
Partner: Robodub

PI: Sumit Roy, CO-PI: Christopher Lum *"Advancing State-of-the-Art UAS Networking and Communication with Software Defined Radios"* **Partner:** Insitu

PI: JK Yang, CO-PI: Anthony Waas *"Development of High Performance Ductile Composites Base on Hybrid C-ply Technology"* **Partners:** Think Composites, Toray Composites America, Chomarat

>> JCATI | www.jcati.org

Professors Behçet Açıkmeşe and **Kristi Morgansen** specialize in the area of Guidance, Navigation & Control (GN&C). The mathematical methods they develop tell an autonomous vehicle how to plan where to go (guidance), how to figure out where it is (navigation), and where it needs to maneuver itself to follow the plan that was built (control). This past year, both faculty members established rewarding collaborations with local aerospace company, Blue Origin, manufacturer of the New Shephard reusable launch system and the New Glenn orbital rocket.

Space launch systems are inherently complex to engineer and can be further complicated by variables like atmospheric conditions, material property interactions, and stresses on the system during re-entry. Blue Origin has pioneered bold advances in vertical-takeoff, vertical-landing (VTVL) technology and embraced the technical challenges that come with this approach by recruiting brilliant engineers and partnering with experts in the field.

Previously at JPL, **Prof. Açıkmeşe** worked on real-time optimization-based control problems that helped land a rover on Mars. Upon realization that this theory could also be useful in rocket landing applications, Prof. Açıkmeşe transitioned to a role in academia where he began developing techniques that ensure rocket landings are repeatable, safe, and robust.

Prof. Açıkmeşe came to UW in 2016 and brought a team of students with him. Açıkmeşe's student, Michael Szmuk, is now on his 4th internship at Blue Origin. This sort of long-term partnership enables deep-dive learning that might not otherwise exist within the bounds of a standard curriculum.

Back on campus, **Professor Kristi Morgansen** is thinking about ways her six-month sabbatical at Blue Origin might support new curriculum within the department. In complex aerospace systems, future engineers will encounter increasing levels of vehicle autonomy, data dependence, and design capabilities enabled by computational modeling tools and advanced manufacturing technologies. Professor Morgansen worked closely with the GN&C team responsible for developing mathematical control methods for the New Glenn orbital rocket. In order to apply their methods to the full complexity of the system, they use a combination of experimental and simulation data. In space applications, the desired data is not always available, so the engineering team compensates by running the model with large ranges of perturbations and disturbances. Their goal? Improve the simulation to more accurately assess potential landing enviroments with a lower volume of data.

Professor Morgansen noted that many of the most transformative technology advances occur when cross-disciplinary integration is supported. By grouping specialists from different disciplines, engineering teams are able to apply creativity and problem solving earlier in the process, often resulting in a better solution in the long run. As Associate Chair for Academics, Prof. Morgansen is championing the adoption of this approach in several areas of the academic experience here at UW.

These Blue Origin collaborations have provided our department with a rare and valuable opportunity to contribute to the next generation of vehicles launching to space — and we will be cheering their arrival each time they safely return to earth again.

Story photo credit: Blue Origin

DIAMOND AWARD RECIPIENT 2017
SUZANNA DARCY-HENNEMANN (BS 81)

As a record-breaking chief pilot, director of flight training and designated captain of multiple jets, Suzanna Darcy-Hennemann's career at The Boeing Company is significant by any measure. As the first woman to serve as a Boeing test pilot and first female captain of the 747-400 and 777, she is a pioneer and role model for women in aerospace and for anyone who aspires to break barriers and achieve their dreams.

Darcy-Hennemann joined Boeing in 1974 as an engineer, and later their frst female test pilot, performing feats that included stalling a jet at 30,000 feet and pulling out of a nosedive close to the speed of sound. Her work was vital for tracking performance in airline service as well as emergency situations. Darcy-Hennemann was named the first female captain on the 747-400, and was also rated to captain the 737, 757 and 767. She went on to become the chief training pilot and head of flight training operations, and was an integral member of the 777 program from conception to certification. In 2005, as chief pilot and project leader, she led the team that set a world record for distance traveled nonstop by a passenger plane by flying from Hong Kong to London in just over 22 hours — a record that still holds to this day. In 2008, Darcy-Hennemann was named chief pilot of Boeing Commercial Airplane Services.

A leader in the global aerospace community, Darcy-Hennemann is a member of the Royal Aeronautical Society, the International Organization of Women Pilots and Women in Aviation International. She was inducted in the Women in Aviation's International Pioneer Hall of Fame, and received their Outstanding Aviator Award. Other honors include the Museum of Flight Pathfinder Award and the Wings Club Award for Outstanding Aviator. She received the UW College of Engineering Diamond Award in May 2017.

DISTINGUISHED ALUMNUS 2016
DR. LELAND NICOLAI (BS 57)

Dr. Leland Nicolai, renowned educator, author, and aircraft designer, was selected as the department's 2016 Distinguished Alumnus.

Dr. Nicolai has spent more than five decades in service to his country as an educator, author and aircraft designer. He spent 23 years in the US Air Force as an R&D officer and aircraft designer (retiring as a Colonel in 1982) and 34 years in the aerospace industry as an aircraft designer/developer (retiring as a Lockheed Martin Fellow). For more than 25 years as an educator, Nicolai conducted aircraft design courses as part of the Lockheed Martin Aeronautics Technical Institute. More than 2,000 practicing engineers went through these programs. Dr. Nicolai has visited more than 20 schools in the last three decades for lectures, design reviews, seminars, and speeches (including the AIAA student chapters, and A&A banquets and graduation). In addition, he has written four textbooks on aircraft design.

While deployed to The Defense Advanced Research Projects Agency in 1977, Nicolai designed and developed a low signature, nuclear tipped, air-launched cruise missile called the Advanced Cruise Missile (ACM). The full-scale design was developed by Convair, San Diego. The ACM program was transferred to the Air Force in 1982 as the AGM-129A. Convair produced 460 ACMs and none were ever launched in anger.

In addition to receiving his bachelor's degree from UW A&A, Dr. Nicolai received a Master's Degree in Aerospace Engineering from the University of Oklahoma in 1962, a PhD in Aerospace Enginering from the University of Michigan in 1968, and an MBA from Auburn University in 1976. His military education consists of Squadron Officer School, Command and Staff College and Air War College.

Life on Mars?

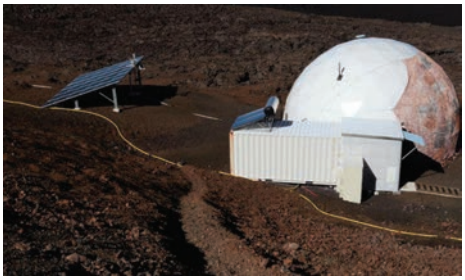
Story by Chelsea Yates

A&A alumna **Ansley Barnard (BS 12)** is one of six volunteers currently participating in a HI-SEAS Mars simulation mission in Hawaii, living in an isolated dome on the slopes of Mauna Loa on Hawaii's Big Island, where the geology mimics that of Mars. She is participating in a NASA-funded Mars simulation mission, known as the Hawaii Space Exploration Analog and Simulation project (HI-SEAS). Managed by the University of Hawaii at Manoa, HI-SEAS is designed to simulate an actual Red Planet exploration mission.

Ansley was selected from a pool of candidates who meet the requirements of NASA's Astronaut Program. For eight months, the team will live and work in a 36-foot-wide geodesic dome, which includes a kitchen, laboratory, bathrooms, sleeping quarters, simulated airlock and work areas. The crew only leave their habitat when exploring the terrain in simulation spacesuits. Crewmembers communicate via Mission Support, though communication is delayed 20 minutes each way, as would be experienced on Mars when it is furthest from Earth.

(Story continues on p.13)

Ansley is the mission's engineering officer in charge of optimizing power consumption, habitat systems and maintenance. This involves data collection and analysis through their habitat sensor network and managing maintenance schedules. She is also responsible for monitoring power usage and the weather forecast. When asked how her studies in A&A prepared her for this mission, Ansley said, "Most of the work I'm doing at HI-SEAS is based on the same engineering principles taught in undergraduate courses. For my senior capstone project, I investigated an architecture to mine resources on the moon. I learned about trade studies and how to prioritize options in a complex system. I developed teamwork skills; we had to work together on a complicated problem for many months. This is exactly what my crew and I are doing now." And asked what she most looks forward to when the mission ends, she responds, "I can't think much further than how nice it will feel to go swimming or walk barefoot over grass. And to eat a fresh avocado!"



>> Mars Mission Blog
www.hi-seas.org

ALUMNI UPDATES

Luke Shindo (BS 57), who retired as a UWAL staff member in 1993, recently touched base to let us know about his second retirement as an engineering advisor for Kawada Industries Co. Ltd. in their low speed wind tunnel in Utsunomiya, Japan. Luke came full circle, moving back to Kobe, Japan, where he embarked in 1952 to begin his college career!

Dennis Ingebretsen (BS 65) was a top graduate of the USAF Navigator & Electronic Warfare Schools and is the owner and aeronautical consultant at Practical Analytics, Inc.

Capt. Dean Weber (BS 71), retired pilot, American Airlines, has published a book: *9/11 An Airline Pilot's Perspective*, about his experience as a pilot during that tumultuous time. His book is available on Amazon.

Dave Plassman (BS 76) reached out to Professor Keith Holsapple after many years. He has been a social worker in Moses Lake, which, he says, shows you that a good background in engineering will take you pretty much anywhere! He still works on engineering related projects, including a 3-D drawing program for blind people, such as himself, and anyone else unable to use a mouse.

Tim Cacanindin (BS 84, MS 95), deputy director, Flight Systems Integration, 773rd Test Squadron of the US Air Force Test Center, took time out from his vacation to visit the department recently, hoping to find a few good students to join their team!

Gordon Gee (BS 84) is a mass properties lead engineer for The Boeing Company, and is an FAA Authorized representative.

Alek Komarnitsky (BS 84) continues to travel to exotic places. Last year, Alek went on a trip to the South Georgia and Falkland Islands where he saw amazing scenery, including hundreds of thousands of penguins! Alek has posted a video compilation of photos from the trip: https://www.youtube.com/watch?v=5siX-AtCMrJc

Timothy Nelson (BS 85, MS 89), associate technical fellow at The Boeing Company, published *Jet City Rewind: Aviation History of Seattle and the Pacific Northwest* (available on Amazon). The book gives fascinating details about the development of flight in the Northwest, covering the role of the UW and the Boeing Company, along with wonderful historical photos.

Adnan Eroglu (MS 86, PhD 91) is principal senior key expert for gas turbines at Siemens Power Generation, Switzerland. Adnan received the Asea Brown Bovery Technology Achievement Award in 1993, the ASME IGTI Best Paper Award in 1996, the ASME Gas Turbine Award in 1998, and the Alstom Green Innovation Award, 2015.

Scott Martin (BS 86, MS 93), who received his PhD in Mechanical Engineering at UW, is a senior scientist at Embry-Riddle Aeronautical University. He also held a Post Doctoral Fellowship at the Center for Turbulence Research at Stanford University.

Chris McLean (BS 89, MS 91) who is a staff consultant at Ball Aerospace, was named Associate Fellow of the AIAA.

Dennis Muilenburg (MS 90), chairman, president and CEO of Boeing, was the 2017 undergraduate commencement speaker at Iowa State University, where he received his BS in Aerospace Engineering. Muilenburg received an honorary Doctor of Science degree for outstanding contributions to the advancement of science and technology, particularly in the field of aerospace engineering.

Rich Johnson (BS 91, MS 94) is functional chief engineer for Boeing Commercial Airplanes, leading a 120 person team supporting Landing Gear, Door, and Window Engineering cradle-to-grave on all BCA models and new airplane projects.

Robert Hoyt's (MS 92, PhD 94) Tethers Unlimited has secured a contract to prepare an Earth orbit test of its technology for robotic, in-space manufacturing of satellite components.

BlackSky, a company owned by **Jason Andrews (BS 94),** which is a service of Spaceflight Industries, has launched its first satellite in a planned 60 satellite constellation designed to allow anyone to order low-cost, custom satellite photos.

Nujoud Merancy (BS 01) is the Orion Mission planning & analysis lead at NASA.

Tony Antonelli (MS 02), retired NASA astronaut, now works as chief technologist for exploration systems at Lockheed Martin where his team is working on a proposal to pre-position key pieces of an outpost in orbit around Mars, and launch the remaining elements and a crew of six there by 2028.

Steven Nielson (BS 04) has been active in politics since high school. His aim is space advocacy and the advancement of technologies. Steve was the 2016 Libertarian candidate for Washington State Public Lands Commissioner.

Sanjoy Som (MS 04) co-wrote an article published in *Nature Geoscience* describing the results of an analysis of trapped air bubbles found inside a 2.7 billion year old lava flow at the Beasley River in Western Australia. Sanjoy, who received his PhD in Astrobiology at the UW in 2010, is founder and research scientist/director of the non-profit research institute Blue Marble Space Instute of Science.

Aleem Wali (MS 07) is now regional director for Airline Economic Analysis, Sales

(Continued on p.14)

ALUMNI UPDATES (CONT.)

Support for the Middle East, Africa and South America at Boeing. Aleem received his MBA at the UW Foster School of Business last year.

Eduardo Gonzalez-Vega (BS 08, MS 11) is a CFD consultant with Analytical Methods, Inc.

Matt Bonna (BS 14) is product manager in Manufacturing Engineering at Boeing.

Seah Ung (BS 15) is a stress engineer at Boeing, and a private pilot.

Nat Guy (MS 16), who is lead user interface developer in the Human Interfaces Group at the NASA Jet Propulsion Laboratory, made a presentation to our students last October about the ways JPL is using immersive, virtual and augmented reality technologies to support ongoing missions to Mars and Europa.

Mia Lee (BS 16) received the first place award in the undergraduate category at the 2016 AIAA Region VI Student Conference. As an award winner, Mia was invited to participate in this year's AIAA SciTech international student competition and she again won first place, triumphing over all of the other regional conference winners.

ALUMNI AND FRIENDS LUNCHEON

In October 2016, the department held its first Annual Alumni and Friends Luncheon. A&A faculty and staff were joined by more than 100 of our alumni, industry partners and friends. **Melissa Wuerl (BS 03)**, director of business development at Spaceflight Industries, was the keynote speaker. It was an opportunity for alumni to connect with one another, with their former professors, and for everyone to celebrate the department's successes. Pioneering engineer **Luella Armstrong (BS 51)** was also recognized for her contibutions to the aerospace industry.

Thank you to all who attended the Alumni & Friends Luncheon.
We hope that those of you who were unable to make it last year will join us this year!

In the meantime, stay in touch. We welcome your involvement as mentors, guest lecturers, student sponsors, and industry ambassadors.

Paying it Forward

Story by Chelsea Yates

When **Emilio Beltran (BS 99)** was growing up, college seemed like a foreign concept. But, thanks to an inspirational grandfather who introduced him to model airplanes and ideas of space travel, Beltran set his sights on studying rocket science. With the support of teachers and family members, he applied — and was accepted — to the UW.

At first, Emilio felt like an outsider on campus. But he soon discovered diversity programs, started to build relationships with advisers and professors who would soon become mentors, dove into his coursework in Aeronautics & Astronautics and began to cultivate a community of friends.

Emilio credits the support network he established as a student with his success at the UW, and he's committed to paying it forward. In 2013 he and his wife Neely created the Beltran Endowed Fund for Undergraduate Student Support to help A&A undergraduates from economically and educationally disadvantaged backgrounds who are also the first in their families to attend college. When asked what prompted him to establish this fund, Emilio said, "I grew up in a small town in Washington, and — to be honest — going to college felt like a long shot. I didn't know anybody aside from teachers at the time who'd even been to a four-year school, let alone for engineering, so in a lot of ways the idea of going to college felt like trying to get to the moon. I was fortunate in that, once I set my sights on applying to college, a lot of people helped me prepare."

Emilio was admitted to the UW and received some scholarships, which, he says, was a big help. "My mom raised me on her own; she didn't have a lot of money, so having financial support to attend school had a big impact on me. So did programs like MSEP, UW's Minority Scholars Engineering Program, through which I met mentors and advisors who helped me carve out a place for myself at the UW." He notes that there were more people in his first math class at the UW than there were in his hometown!

"Now I'm in a position where I can give back, and that's what I want to do," says Emilio. He wants to help students the way others helped him. Asked to offer advice to today's engineering students, he says, "It might not seem like it at first, but there are so many great resources available for students if you seek them out. Connecting with academic advisors, MSEP mentors, even students through the various clubs, teams and organizations can make the UW feel less overwhelming and more accessible. And above all, don't be afraid to try new things; after all, you're in college! It's a great time to step out of your comfort zone and discover new things about yourself." We are grateful for the generosity of Emilio and Neely, who are 'paying it forward' to encourage future engineers to start their academic careers.

>> Support this Fund
aa.washington.edu/giving
Beltran Endowed Fund
for Undergraduate Student Support

IN MEMORIAM

JOSEPH F. SUTTER
1921 – 2016

Just as the 747 is iconic, so is one of UW Engineering's most accomplished and beloved alumni, **Joe Sutter (BS 43)**, "Father of the 747." His passing leaves a void in the hearts of many.

Joe's career began at Boeing as an aerodynamicist and he quickly moved on to prominent roles on design teams for the 707, 727, and 737—planes that established Boeing as a world leader in commercial aviation. Joe invented the concept of "wide body" aircraft. The 747 series of airplanes continue to carry much of the world's cargo and passengers, and Boeing continues to build upon the outstanding earliest design of the 747. As executive vice president of Commercial Aircraft, Joe was "chief" engineer to thousands of Boeing engineers, and his mentorship set the stage for future success.

Many prestigious honors have been awarded to Joe, including the National Medal of Technology, UW's Alumnus Summa Laude Dignatus Award, and designation as a fellow in the NAE, the AIAA and the RAS. In his retirement, Joe continued as a consultant and advocate for Boeing commercial aircraft. He remained a champion for our department as well.

To honor Joe, a fund was established to support undergraduate scholarships, senior design projects, and K-12 engineering outreach in the William E. Boeing Department of Aeronautics and Astronautics.

>> Support this Fund
aa.washington.edu/giving
The Joseph F. Sutter Endowed Education Fund

KUEN Y. LIN
1946 – 2017

We mourn the passing of **Professor Kuen Y. Lin**. Professor Lin served on the A&A faculty for 33 years as a dedicated professor, mentor and colleague. After receiving his bachelor's degree from National Taiwan University and master's and doctoral degrees in Aeronautics and Astronautics from MIT, Professor Lin spent six years in industry, working for Deere & Co. and The Boeing Company. Professor Lin was an expert in the areas of composite materials, finite element methods, and fracture mechanics, and co-creator of the Mar-Lin Fracture Model, which is used by the aerospace industry for the damage tolerant design of composite aircraft structures. He also developed a singular hybrid finite element method for the accurate analysis of bi-material fracture problems. His recent research had direct applications to the critical technologies needed in developing the next generation of aerospace vehicles.

In addition to teaching structures and composites classes to hundreds of our students, Professor Lin was a co-founder and co-director of the UW FAA Center of Excellence for Advanced Materials in Transport Aircraft Structures. He also developed the UW-Boeing Certificate Program in Aircraft Composite Structural Analysis and Design, and in 2014, he was awarded the UW Distinguished Contributions to Lifelong Learning Award. More recently, Professor Lin co-developed an online course on composite materials with Boeing, UWEO and edX, which enrolled more than 12,500 students from 154 countries.

Professor Lin's contributions in industry and academia were many and will leave a lasting legacy. He greatly enriched the lives of his students and colleagues, and will be missed but always remembered by all whose lives he touched.

ANITA ABREGO
1970 - 2016

It is with much sadness that we share the loss of alumna **Anita Abrego (BS 94)**. Anita graduated from UW A&A in 1994, though she was a member of the class of 1993. A strong advocate for underrepresented populations, Anita was active at the UW in the Society of Hispanic Professional Engineers and in the American Indian Science and Engineering Society. After receiving her MS from the University of Colorado Boulder in 1996, Anita took a position with NASA, where she continued her advocacy work, chairing the Native American Advisory Committee for the NASA-Ames campus. She served as a mentor and role model to young women pursuing engineering and the sciences.

Anita was a highly-recognized and awarded research scientist in the field of rotor blade dynamics. She managed wind tunnel test programs for NASA, for the US Army, and for the US Navy. She was recognized multiple times during more than 25 years in her career at NASA, including the NASA Equal Employment Opportunity Medal. In 2005 she was recognized by *Science Spectrum Magazine* as the Top Minority in Science winner. In Spring 2009, Anita was named by UW as "One of the top 40 emerging leaders from underrepresented communities to watch."

More important than her professional accolades, however, was Anita's character. She was an incredibly generous person with both her time and her spirit. To honor her memory, two of Anita's classmates, Bill Fishburn and Juan Carlos Varela, have started a memorial student endowment fund at the University of Washington for women pursuing engineering degrees, especially those of Native American and/or Latina descent. Please consider making a donation in Anita's memory.

>> Support this Fund
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Anita Abrego Endowed Student Support Fund

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THE JORDAN EDUCATION TRUST
GEDA AND PHIL CONDIT ENDOWED FELLOWSHIP

Geda Condit (BS 77) and Phil Condit, retired President and CEO of Boeing, generously established **The Jordan Education Trust - Geda and Phil Condit Endowed Fellowship** to support a meritorious student who has graduated from high school or university in Jordan, and who has expressed an intent to teach in Jordan.

The Jordan Education Trust (JET) was formed by the Condits for the purpose of building bridges between Jordan and the United States through education. JET has helped to train teachers from both Jordan and the United States through an exchange program in which teachers from both countries study together.

Geda Condit was born in Jordan and moved to the United States at age 15. Upon graduation from UW A&A, she accepted a position at The Boeing Company, working on a number of programs including the 777, New Large Airplane, and Composites Joint Venture with China. Upon retirement, Geda and her husband, Philip Condit started JET in recognition of her heritage and their joint passion for aviation and education. The department is honored to partner with the Condits on this collaborative endeavor.

>> Support this Fellowship
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Geda and Phil Condit Endowed Fellowship